August 13, 2007

M E M O R A N D U M

TO: Mark Mason, P.E.
Engineering Manager, Boise Regional Office

FROM: Valerie Greear, E.I.T.
Boise Regional Office

SUBJECT: **Staff Analysis of The Reserve at Lake Cascade, LLC (Bella Reve PUD) Wastewater Reuse Permit (Draft), LA-000213-01 (Municipal Wastewater)**

Purpose

The purpose of this memorandum is to satisfy the requirements of the *Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater* (Rules), IDAPA 58.01.17.400.04, for issuing wastewater reuse permits. This memorandum addresses the Draft Permit No. LA-000213-01, for the private municipal wastewater treatment and reuse system owned and operated by The Reserve at Lake Cascade, LLC, for the Bella Reve Planned Unit Development (PUD), hereafter referred to as Bella Reve or the permittee.

Summary of Events

A wastewater reclamation and reuse permit application was received on November 21, 2006. The application was determined complete, and a preliminary decision to prepare a draft permit was disclosed in a letter sent to the permittee on May 10, 2007. A preliminary engineering report (PER) was received on August 25, 2006 and approved on October 5, 2006 after supplemental information was submitted.

According to a letter dated January 16, 2007 from Kristen Van Engelen, managing partner for Bella Reve PUD, to DEQ, addressed to Tiffany Floyd, the permittee has attempted to attain will serve commitments from North Lake Recreational Sewer and Water District (NLRSWD) starting in the spring of 2005. NLRSWD has nearly reached capacity to serve the district and is planning expansions. In order to be served by the sewer district, Bella Reve would have to provide a lift station and a force main that would cross the Gold Fork arm of Lake Cascade. In addition, there are no final plans in place for the expansion of NLRSWD, and therefore no assurance to Bella Reve that there would be treatment capacity available by the time they would need it. This complication in addition to the time and expense required to plan and construct the lift station and force main led the permittee to request that DEQ permit Bella Reve to privately treat and reuse the municipal wastewater generated within their PUD.

The permit application, the PER, and other supplemental information submitted by the permittee were used to develop Draft Permit No. LA-000213-01 for a public review and comment period. After the public review period is closed, DEQ will provide written responses to all relevant comments and prepare a final permit for Bella Reve's wastewater reuse facilities.

Site and Process Description

The Reserve at Lake Cascade, LLC is proposing to construct a PUD known as Bella Reve in unincorporated Valley County, south of Donnelly. The site covers 551 acres, and is adjacent to Lake Cascade. At build out, the PUD will contain 640 residential units, and a total of 714 Equivalent Dwelling Units (EDUs) implemented in 5 phases. The PUD will also include commercial buildings, a recreational center, emergency medical services buildings, an equestrian center, a hotel, and a restaurant.

The permittee has proposed to construct and operate a Membrane Bio-Reactor (MBR) wastewater treatment plant that will produce Class A reuse water. The treatment plant will consist of the headworks, solids dewatering, a series of underground covered concrete basins containing anoxic and pre-aeration stages followed by the MBR cassettes, and finally UV disinfection. There will be three treatment trains to provide treatment redundancy, each with an anoxic basin, pre-aeration basin, and MBR basin.

The headworks will consist of fine screens in the influent channel and a screening washer/compactor; compacted solids will be stored prior to transfer to a landfill. Solids generated from the MBR process (sludge buildup) will be dewatered and either land applied or sent to a municipal landfill, which will be addressed in the Solids Waste Management Plan as a compliance condition in the permit. Effluent will be disinfected using UV radiation prior to storage in the pond.

The first phase is designed for an average daily flow of 32,040 gpd and a peak flow of 64,080 gpd. At build out the average daily flow is projected to be 121,810 gpd with a peak hour of 243,620 gpd. The permittee anticipates that 25 homes will need to be occupied before there is sufficient flow available to start up the MBR facility. Prior to this, wastewater will be collected at the treatment plant headworks and trucked to a permitted facility, most likely the City of Cascade. A formal agreement has not yet been reached and approved by the City Council, but the process has been initiated, as is documented in a letter from Robyn Taylor, Forsgren Associates, Inc., dated June 22, 2007.

The facility will provide redundant capacity within the treatment plant in the event that treated effluent from a given train does not meet required discharge limits. The redundant capacity will meet the requirements of an *equivalent backup system* capable of treating peak day flow (IDAPA 58.01.16.601.07.a.i.3 of the Rules). The details of the redundancy will be presented within the treatment plant plans and specifications, and will have to meet the requirements of IDAPA 58.01.17-601.07.a. for both redundancy and back-up. The premise of the redundancy capacity was presented in a document received on July 26, 2007 from Gary Ashby of Forsgren Associates, Inc., and further discussed with him in a meeting on July 30, 2007. In summary, the facility will have three treatment trains which, when operating under normal conditions require that 5 of the filter cassettes be operational to treat peak day flow (see Table 3 for design flows). Each of the three trains has three filter cassettes. Therefore a peak day flow of 210,000 gallons per day could be treated with one treatment train off line leaving 6 filter cassettes operational. Since only 5 cassettes are needed to treat the 210,000 gallons per day, the sixth filter cassette provides 42 gfd* additional treatment capacity for back-up to treat the remaining wastewater in the down train. This provides the required redundant capacity and back-up. The redundancy option will be employed if the turbidity exceeds the instantaneous maximum value of 0.5 NTU for more than five minutes, or if the disinfection system does not achieve the required 5-log inactivation of virus for more than 5 minutes.

* The maximum allowable flux rate for the membranes is 42 gfd (gallons per square foot per day). See the letter dated October 20, 2006 from Mark Mason, DEQ, to Nathan Brown, Enviroquip regarding the acceptance of Kubota Type 515 Flat Plant submerged membrane filtration technology, on the DEQ website.

The treatment facility will produce Class A effluent to be reused onsite for ground water recharge and for community and residential irrigation (land application). The ground water recharge basin will be approximately ¾ mile from Lake Cascade, and is currently designed to hold 9.5 MG (29 acre-ft) of water. At build out a total of 250 acres of irrigation area are expected to be available on residential properties, commercial properties, and common areas.

The reuse water will be transmitted 5000 feet via a force main from the treatment facility located in the southern area of the site to the recharge basin in the northeast corner of the site (see Site Map No. 2 of the draft permit). During the growing season, supplemental irrigation water will be gravity fed to the recharge basin from the canal located along the northern site border. Reuse water transmitted from the treatment facility and water from the recharge basin will both flow into a wet well from which water will be supplied to the site via pressurized irrigation. During the non-growing season reuse water will flow from the wet well into the recharge basin and percolate to ground water (see figure nos. 1 and 2).

Soils Evaluation

Ten test pit excavations were completed by ASAProbe, Inc. on October 18 and 19, 2006. As is described in the permit application, these excavations revealed that silty sand was generally encountered at the ground surface to one to 3.5 feet bgs, underlain by interbedded layers of sand with gravel and clayey silt. The sand layers were finer and contained less gravel to the south, and sand became coarser to the north toward the Gold Fork River. Table 1 shows the analytical test results of soil bore samples, in order of soil sampling depth.

Table 1: Analytical test results of individual soil boring samples taken in October of 2006, in mg/kg.*

Sample Identification	Sample Location Relative To Site	Soil Sampling Depth	Percent Moisture	Organic N (TKN)	Nitrate	Nitrite	Total P	Ortho PO_4	pH
BR-6	E	0-2	18.1	1680	ND	6	165	16.1	6.18
BR-7	NE	0-2	12.3	1640	6.7	2.2	257	12.3	5.54
BR-8	N	0-2	11.1	265	1.8	2.4	152	10.8	6.42
BR-10	NW	0-2	11.8	1060	1.8	1.6	544	7	6.23
BR-3	S	2-4	18.1	110	1.7	2.1	214	12.7	6.62
BR-4	S	2-4	11.7	17	ND	4.5	102	17.7	5.84
BR-9	Center	3-5	3.2	355	1.6	ND	294	6.6	6.66
BR-1	SW	8-10	16.9	15	1.7	2.9	211	9.4	6.86
BR-2	SW	10-12	10.1	13.9	2	2.9	145	16.2	6.53
BR-5	W	12-14	14.4	ND	ND	7	164	22.2	6.36

*Also measured were ammonia and mercury, with non-detects in all samples.

This site has historically been flood irrigated and had a ranching operation grazing 350 head of cattle. This is reflected in some of these initial soil samples. The borings nearest to the recharge basin are BR-8 and BR-9.

Surface Water Evaluation

The Bella Reve PUD is located in the North Fork Payette Subbasin, Hydraulic Unit Code (HUC) 17050123. Running north of the site is the Gold Fork River, unit SW-8, which is a source to the Cascade Reservoir, unit SW-7. The Gold Fork River and Cascade Reservoir are designated water bodies in the Water Quality Standards, IDAPA 58.01.02.140.17, with listed beneficial uses of domestic and agricultural water supply, cold water biota, salmonid spawning, and primary and secondary contact recreation. In addition, the Gold Fork River is a special resource water, which is defined as a specific segment or body of water recognized as needing intensive protection to preserve outstanding or unique characteristics and/or to maintain current beneficial uses. Detailed descriptions of beneficial uses of designated surface waters are found in IDAPA 58.01.02.100.

The pollutants of concern for the Cascade Reservoir and its tributaries are phosphorus, pathogens, ammonia, sediment, temperature, flow alteration, habitat alteration, dissolved oxygen, and pH. A Total Maximum Daily Load (TMDL) was developed for the reduction of phosphorus in the Cascade Reservoir and its tributaries. The pollutant of concern relative to the wastewater reuse at Bella Reve is phosphorus.

The ground water recharge basin will be located approximately ¾ mile upgradient from the Cascade Reservoir. Section 1.5 in the wastewater section of the submitted Preliminary Engineering Report (PER) contains an assessment of the sites potential phosphorus impact on surface water. At present the site is being used to graze 350 head of cattle, contributing approximately 5250 pounds of total phosphorus (TP) per year, based on a 1992 USDA guide. The Bella Reve development will contribute approximately 37 pounds of TP per year based on a concentration of 0.1 mg/L in the reuse water. Replacing cattle grazing with a PUD on the site will therefore reduce the TP impact by 99%. The goal of the Cascade Reservoir TMDL is to reduce the contribution of phosphorus from external sources by 37%. Therefore, the construction of the PUD and the associated wastewater reuse project will not further degrade the surface water with respect to phosphorus loading.

In addition to the natural water bodies near the site, there is also a canal running adjacent to and through the site, and several water bodies will be constructed on the site for recreation purposes. The site also contains numerous wetlands that will either remain or be mitigated in accordance with Corps of Engineers guidelines. Refer to Site Map No. 2 in the draft permit to see the locations of these water bodies. The wetlands are and will remain in connection with the canal, and reuse water will not flow into these areas at any time. The canal will be connected to the recharge basin via gravity feed, and the design will have to show that reuse water will not backflow into the canal. Protection of wetlands from land application of reuse water will be addressed in the compliance condition, CA-213-01, to create, maintain, and follow a plan of operation.

Ground Water and Hydrogeologic Evaluation

Information about ground water at the site is included in the PER and supplemental permit application materials. The geological assessment of the site, conducted by SPF Water Engineering, described the hydrogeology based primarily on information from four nearby well sites: two deep production wells at Arrowhead Point west of Bella Reve, and two deep production wells at Fir Grove, across the Gold Fork River from the Bella Reve site. The data obtained from these well logs indicates that the stratigraphy beneath the site is expected to consist of surficial glacial outwash sediments extending to depths of less than 100 feet underlain by interbedded sand, gravel, cemented sand, silt, and clay. Low permeability silt and clay layers in the valley-fill sediments are expected to comprise between 18% and 38% of the geologic section overlying the production zones with the shallowest individual clay layers ranging in thickness from about 3 to 50 feet. These clay layers appear to have been deposited in a lake environment and therefore are likely have broad areal extent. Even if individual clay layers are not areally extensive, the clay layers in aggregate will form an effective barrier to vertical ground water movement. It is therefore expected that there is a perched aquifer, the general depth of which extends to approximately 50 feet bgs. Further below this aquifer is a generally confined aquifer, which will be tapped for a production well.

The hydrogeologic evaluation asserts that the water chemistry between deep wells and shallow borings highlighted differences consistent with aquifers independent from each other. The four drinking water wells at depths of 240-450 feet had non-detectable levels of nitrate, ammonia from 0.52-1.01 mg/L, and TDS from 84-122 mg/L. The ground water near the surface, sampled from the exploratory borings is included in Table 2.

Table 2: High and Low detections in exploratory boring wells.

	Detection		
	Low	High	Units
Static Water Depth	18	2	ft bgs
Total Organic Carbon	ND	10.9	mg/L
Chloride	0.55	1.33	
Conductivity	48.6	87.8	
Ammonia	ND	0.37	
TKN	ND	0.7	
Nitrate	ND	0.52	
Nitrite	ND	0.15	
Total Phosphorus	0.038	0.58	
Ortho-Phosphate	0.01	0.31	
TDS	23	433	
Sulfate	ND	1.91	
pH	6.1	6.49	pH

A discussion of ground water travel times was prepared by Jennifer Sukow, P.E., P.G., of SPF Engineering, LLC. The analysis was prepared to show that there was a greater than 6 month travel time in ground water between the recharge basin and the future onsite drinking water well. The drinking water well will be approximately 3600 feet SW of the recharge basin, indirectly downgradient (refer to Site Map 2 of the draft permit). The analysis assumed a 200 ft seal on the drinking water well, and concluded that there is limited hydraulic connectivity between the recharge basin and the supply well. The projected ground water travel time between the ground water recharge basin and the drinking water well was at least 16 years.

In addition to the drinking water well to be drilled onsite, there are two downgradient drinking water wells in the confined aquifer, at 240 ft bgs and 443 ft bgs, which supply water to the Arrowhead Point Subdivision west of Bella Reve. The conclusion reached in the geotechnical analysis that there is a travel time of 16 years to go 3750 feet from the recharge basin to a drinking water well pumping water at 200 ft bgs provides assurance that contamination of these drinking water wells is not anticipated.

Also downgradient from the site is a drinking water well sealed to a depth of 78 ft bgs registered to the Daystar Conference Center. It is located approximately 500 feet from the site boundary, and approximately 3000 feet generally downgradient from the recharge basin (see Site Map 2 of the draft permit). Current analysis has not ruled out the possibility of this well being affected by the recharge basin, and therefore **staff recommends that the Daystar Conference Center well be subject to monitoring by The Reserve at Lake Cascade, LLC in April and October of each year beginning when the recharge basin is put into use.** Monitoring of this well will provide information about seasonal ground water levels, constituent concentrations, and other hydrogeologic data, and could potentially show effects of the reuse site on regional ground water. In addition, there are several individual drinking water wells north of the site. **Staff recommends that all drinking water wells within ¼ mile of the Bella Reve site be sampled at the beginning and end of the permit term.** If the owner of a private well refuses to grant permission for the permittee to sample the well, documentation of the attempt to gain permissions shall be provided in lieu of analytical sampling results.

Projected Wastewater Quality and Loading Rates

Wastewater Quantity

The quantity of wastewater expected to be produced is presented in the PER. The Bella Reve PUD is anticipated to resemble the residential area around Lake Cascade which is comprised primarily of vacation homes. Therefore wastewater flows are expected to be lower than the wastewater flow standards typically used to design treatment plants. Wastewater flow is expected to have an annual average daily flow of 90 gpd/EDU, based on average flows experienced in comparable areas, namely 79 gpd/EDU for the North Lakes Regional Sewer and Water District and 94.6 gpd/EDU at the Sundance Resort in Utah.

The facility will be designed for an assumed 60% occupancy rate, higher than the expected 90 gpd/EDU to ensure the necessary available capacity. Wastewater flow has been estimated as 120gpd/person with 2.5 people/household, so 300 gpd/EDU at 60% occupancy (180 gpd/EDU). The maximum month and peak hour multipliers were based on actual data from comparable areas, and are 1.7 * average annual daily flow and 2.0 * average annual daily flow respectively. Table 3 shows the anticipated flow rates for the various phases of development.

Table 3: Cumulative Reuse Water Generation

Phase	EDU's	Average Daily Flow (gpd)	Cumulative Flow (gpd)		
			Average Daily[1]	Peak Day[2]	Peak Hour[3]
1	178	32040	32040	54500	64080
2	173.7	30760	62800	106800	125600
3	158.1	28130	90930	154600	181860
4	76	13320	104250	177200	208500
5	128.2	17560	**121810**	**207100**	**243620**

[1] Flow is based on 60% occupancy using an average household size of 2.5 people/household at 120 gpd/person (180 gpd/EDU)
[2] Peak daily flow is 1.7* average daily flow
[3] Peak hourly flow is 2.0 * average daily flow

Wastewater Quality

Wastewater reuse quality is dictated by ground water recharge for the Bella Reve PUD. Recharge occurs year round, while landscape irrigation will take place only during the growing season (April through September). As such, the reuse water will be limited to the recharge limits in the Rules. The last row of the following table shows the level of treatment required by the draft permit or anticipated by the permittee.

Table 4: Projected influent wastewater daily loadings and concentrations, and Anticipated Treatment Levels

		Cumulative Projected Influent Daily Loadings, lb/day			
Phase	EDUs	BOD	TSS	Total Nitrogen	Total Phosphorus
1	178	63	63	22	2.14
2	351.7	123	123	42	1.49
3	509.8	178	178	61	6.07
4	585.8	204	204	70	6.96
5	714	239	239	82	8.13
Anticipated Influent Concentration, mg/L					
Daily Average[1]		235	235	81	8
Anticipated treatment levels, mg/L					
30-Day Average		5[2]	5[3]	10[2]	0.1[4]

[1] The projected influent wastewater loadings are consistent with actual measurements listed in the NLRSWD Facilities Planning Study Addendum.
[2] Level of treatment required by IDAPA 58.01.17.601 for ground water recharge.
[3] Level of treatment anticipated by permittee in the PER, but not required in the draft permit.
[4] Level of treatment required by the draft permit.

The projected influent wastewater loadings are consistent with actual measurements listed in the NLRSWD Facilities Planning Study Addendum. Treatment levels are based on the Class A requirements from the Rules and/or required by the draft permit or are anticipated in the design.

Projected Permit Limits, Hydraulic Loading Rates

Wastewater is reused at Bella Reve in two ways, through sprinkler irrigation and ground water recharge. During the growing season, wastewater will be reused primarily as sprinkler irrigation. During the nongrowing season when the site is not permitted to irrigate with reuse water, ground water recharge will be the exclusive means of wastewater reuse.

During the growing season, reuse water and supplemental irrigation water from the onsite canal will be mixed prior to land applying (see Site Map 2 of the draft permit). The supplemental irrigation water is gravity fed to the recharge basin and mixes with the reuse water. Reuse water is pumped from the treatment plant to a wet well at the recharge basin. Water for irrigation will be pumped from this wet well to the recipients. Refer to Figure Nos. 1 and 2 (submitted by Forsgren Associates Inc.) for diagrams of this. When the irrigation pump is in use, water flows from the recharge basin into the wet well and mixes with the reuse water being pumped from the treatment plant. The irrigation pump pulls water from this mixture of reuse and supplemental irrigation water in the wet well and pumps it to points of use throughout the site (Figure 1). When there is no demand for irrigation water, the reuse water will still flow into the wet well from the treatment plant, and will flow from there into the recharge basin (Figure 2).

Figure 1: Wet Well Operation During Irrigation, Preliminary Design[1]

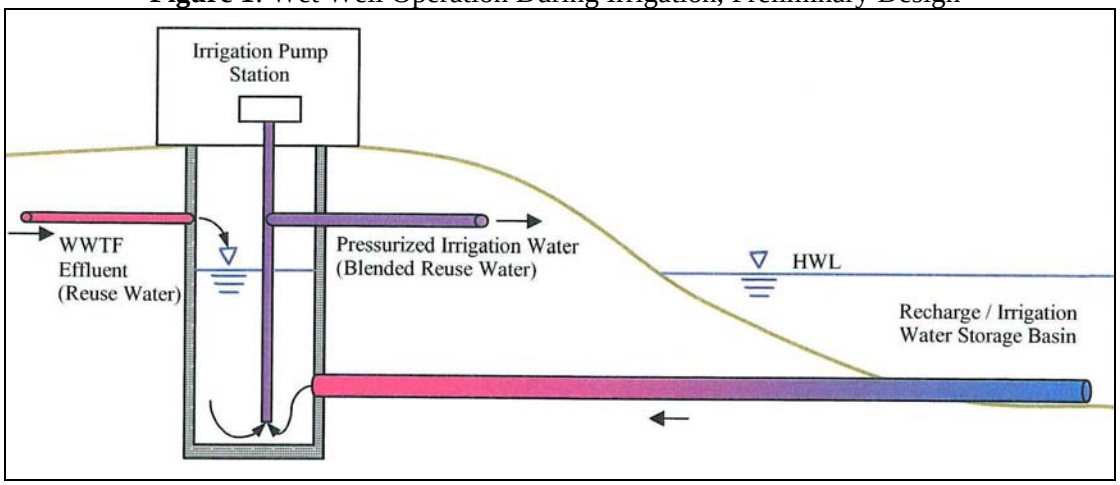
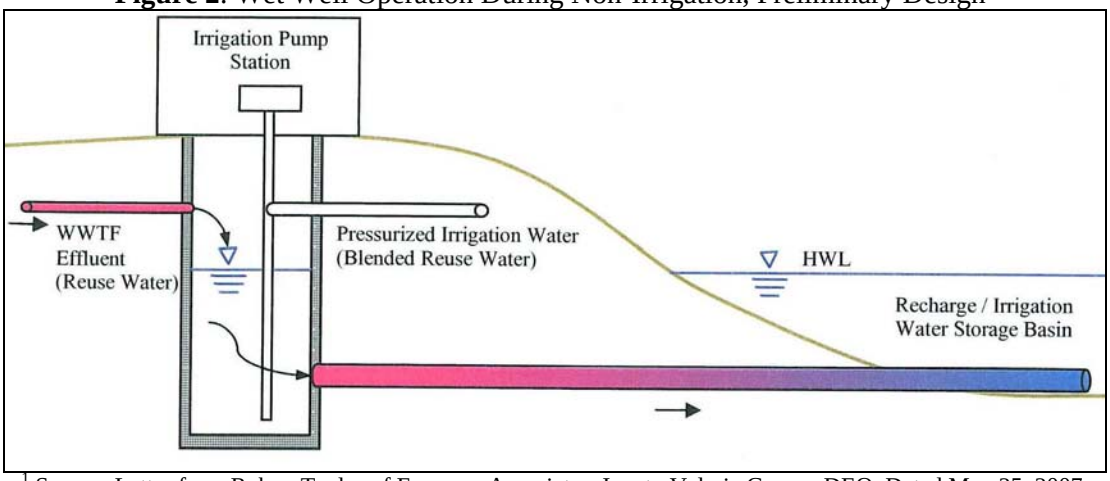


Figure 2: Wet Well Operation During Non-Irrigation, Preliminary Design[1]



[1] Source: Letter from Robyn Taylor of Forsgren Associates, Inc. to Valerie Greear, DEQ, Dated May 25, 2007.

During the growing season, when there is a demand for pressurized irrigation, it can be assumed that essentially all of the reuse water will be used for irrigation. Refer to Table 5 for a comparison of Irrigation Water Requirement (IWR) to the estimated effluent production. Areas to be irrigated include lawns and landscaping for common areas and both residential and commercial lots (refer to Site Map 2 of the draft permit).

The Precipitation Deficit, or Irrigation Water Requirement (IWR), for turf grass in the McCall area can be found at this website: http://www.kimberly.uidaho.edu/ETIdaho/stcvrstats.php?station=105708&cover=17&stats=Deficit. The following table shows the IWR for turf grass.

Table 5: Irrigation Water Requirement for 250 Acres of Turf Grass in the McCall Area

	IWR for 250 Acres of Turf Grass in the McCall Area[1]			Projected Effluent Production at Build-Out[2]
	in/mo	acre-ft/mo	MG/mo	MG/mo
Mar	0.30	6.29	2.05	3.78
Apr	0.47	9.85	3.21	3.65
May	1.49	31.13	10.15	3.78
Jun	4.73	98.50	32.10	3.65
Jul	7.01	146.09	47.61	3.78
Aug	5.86	122.14	39.81	3.78
Sep	2.41	50.12	16.33	3.65
Oct	0.06	1.20	0.39	3.78
Total: MG/Growing Season			**151.65**	**29.85**

[1] Source: Allen, Richard G. and Clarence W. Robison, 2006 (Revised 2007). *Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho, Research Technical Completion Report*, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.

[2] This does not include reuse water in the pond from winter storage, nor does it include supplemental irrigation water from the canal.

The data in Table 5 shows that through most of the summer the demand for irrigation water will most likely exceed the rate of generation of reuse water. Therefore supplemental irrigation water from the canal is necessary to provide the IWR for the site. The ratio of reuse water to supplemental irrigation water will depend on the season primarily, with the highest proportion of reuse water being applied during the spring because the water in the recharge basin will be comprised primarily of reuse water at that point.

A conservative assumption for the non-growing season is that all of the reuse water recharges ground water. An estimated 121,800 gal/day will be added to the recharge basin. A percolation rate of 0.5 ft/day was estimated in the PER to occur year round from the basin. This results in a hydraulic loading rate of 85,000 gal/day on the 6.25 acre recharge basin. The ground water level is high, 5-11 ft bgs in the nearest exploratory borings in November, and likely to be higher in the spring. Therefore the reuse water will readily recharge and mix with ground water.

The site is currently flood irrigated with water from the canal, and will now be sprinkler irrigated with a combination of reuse and canal irrigation water. In addition, during the growing season the recharge basin will primarily recharge ground water with supplemental irrigation water from the canal since all irrigation water distributed on the site originates at the recharge basin. Therefore, land application on the site during the growing season will consist primarily of the same source of water, canal water, currently being applied to the site. Because irrigation water will be directly recharging the aquifer and in order to estimate loading to the site, **staff recommends that the irrigation water be monitored monthly during the growing season at the irrigation pump for Total Nitrogen and Total Phosphorus.**

Application via irrigation will be spread over a large area (approximately 250 acres) and will include both reuse water and supplemental irrigation water. Reuse water that is recharging ground water will mix with the ground water in the basin and will percolate and flow towards the lake. Due to the high quality of reuse water and the degree of mixing prior to reuse, **staff recommends that no hydraulic loading rate limits be included in the Reuse Permit.**

Permit Limits, Constituents

Nitrate:
The ground water within the site boundaries is good quality with respect to nitrate. The travel time analysis (discussed in the ground water/hydrogeological section of this document) used ground water nitrate data from water samples in the exploratory borings (10 borings on site by ASAProbe, Inc. on October 18 and 19, 2006) to estimate the nitrate concentration in the ground water. The concentration used was 0.33 mg/L, which was the average of the 4 ground water samples that were not non-detects, and were taken in exploratory borings with static water levels of 9-14 feet bgs.

Nitrate from effluent is anticipated to enter ground water primarily during the nongrowing season when reuse water will enter the ground water unmitigated. During the growing season, the nitrate in the reuse water will be taken up by the grass and other landscaping being irrigated. In the Rules, nitrate at a concentration of up to 30 mg/L in reuse water can be used for irrigation. However, because the reuse water will be recharging ground water during the nongrowing season and to some extent during the growing season, **staff recommends that Total Nitrogen in effluent be limited to 10 mg/L**, the standard set in the Rules for ground water recharge. Total Nitrogen will be monitored in the effluent at the point of compliance, and once a year will be sampled at the irrigation pump to provide information about the nitrate level in the canal water.

The downgradient beneficial use of the ground water is minimal with regard to nitrate due to the close locale of the site to Lake Cascade. The majority of the reuse water recharging the ground water will flow to the lake, and there is no surface water standard for nitrate in Idaho. Refer to the ground water section of this document for the staff recommendations for monitoring of drinking water wells.

Phosphorus:
The Surface Water Evaluation section of this document contains a discussion of phosphorus levels at this site. Phosphorus impact has been shown as a problem in this area, and there is a TMDL implemented for Lake Cascade and its tributaries. Ground water within the site boundary has phosphorus levels that are above what the phosphorus concentration in the wastewater effluent is projected to be. Based on influent phosphorus levels seen by the NLRSWD, the PER estimates that the Total Phosphorus concentration in untreated wastewater will be approximately 8 mg/L. An estimate by Enviroquip, Inc., submitted in the PER, shows that the MBR design with influent rates and concentrations at three development phases should be able to achieve Total Phosphorus levels of less than 0.1 mg/L. Ground water phosphorus was as high as 0.58 mg/L in an exploratory boring with static ground water at 2 ft bgs. See Figure 3 for soil phosphorus and ortho-phosphate levels, and Figure 4 for groundwater phosphorus and ortho-phosphorus levels.

Figure 3: Phosphorus and Ortho-Phosphorus levels in Soil Boring Samples[1]

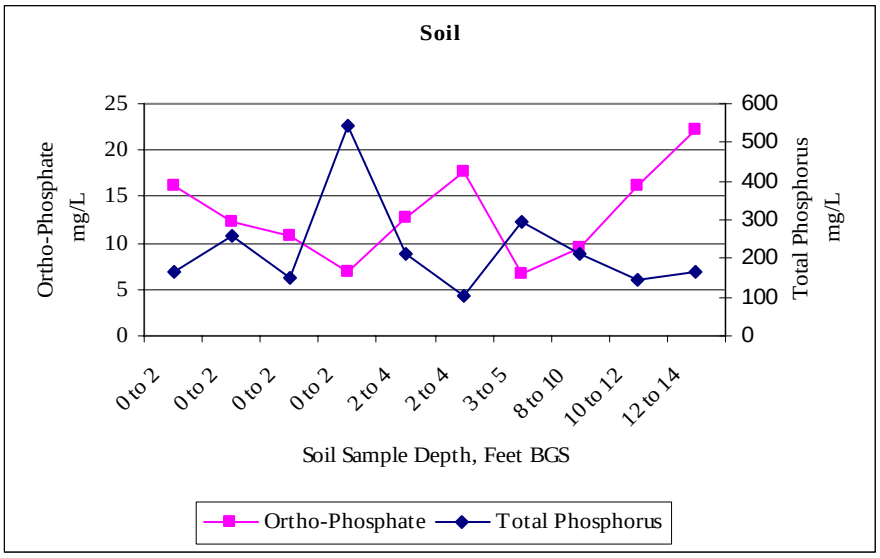
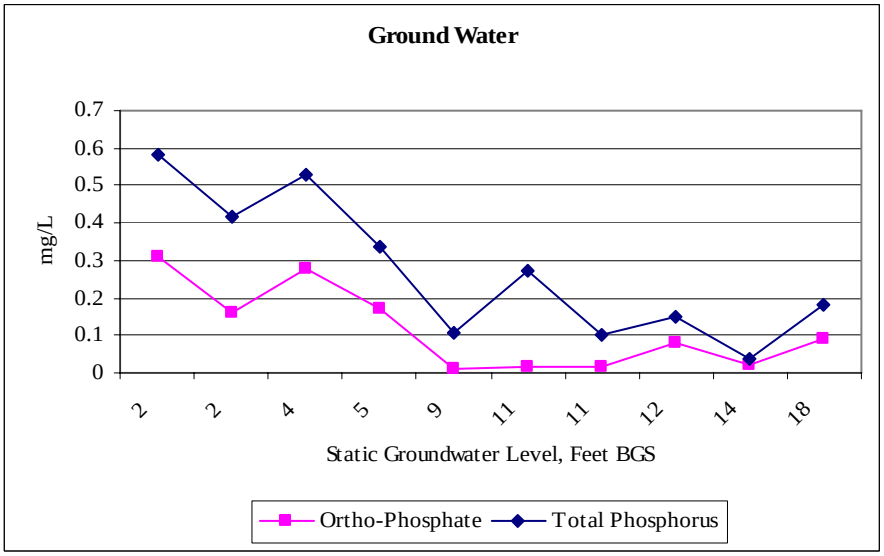


Figure 4: Phosphorus and Ortho-Phosphorus levels in Ground Water from Soil Boring Samples[1]



[1] Data are from ten test pit excavations exploratory borings taken by ASAProbe, Inc. on October 18 and 19, 2006.

The phosphorus levels predicted to be achieved by treatment will generate effluent with Total Phosphorus concentrations near or below current ground water concentrations. In addition, the phosphorus loading onsite will be significantly less than the current phosphorus loadings from cattle grazing. Given the high level of phosphorus in ground water and the close proximity of the recharge basin to the Gold Fork River, which has a special resource water designation, **staff recommends that Total Phosphorus be limited to 0.1 mg/L, and that Total Phosphorus and Ortho-Phosphate be monitored in the effluent.** Staff has also recommended that Total Phosphorus be monitored at the irrigation pump to estimate the phosphorus being applied to the site via canal water.

5-day Biological Oxygen Demand (BOD_5):
The draft permit limits 5-day Biological Oxygen Demand (BOD_5) as is set out by the Rules. The draft permit reads as follows: "Five-day Biological Oxygen Demand (BOD_5) shall not exceed 5 mg/L based on monthly arithmetic mean as determined by weekly composite sampling". The monitoring section of the permit requires that BOD_5 be sampled on a weekly basis at the monitoring point following disinfection and prior to the ground water recharge basin.

Turbidity:
The disinfection requirements for Bella Reve mirror the requirements set out in the Rules for a wastewater treatment facility utilizing membrane filtration and producing Class A reuse water. The permit states the requirement as "the daily arithmetic mean of all daily measurements shall not exceed 0.2 NTU, and turbidity shall not exceed 0.5 NTU at any time. Turbidity measurements shall be taken post-filtration and pre-disinfection."

Turbidity shall be continuously monitored with a turbidimeter. If at any time the effluent exceeds 0.5 NTU for more than 5 minutes, the effluent will be automatically routed back to one of the other treatment trains to be retreated prior to discharge.

Capacity of Wastewater Treatment System:
During the growing season, the capacity of the reuse treatment system (land irrigation and groundwater recharge) will exceed the reuse water generation and constituent loading, as is explained in the previous section. During the non-growing season, when irrigation is not allowed, all reuse water generated will terminate in the recharge basin. Therefore the basin will need to be capable of accepting the full amount of water generated. The permit application assumes a percolation rate of 0.5 ft/day year-round. This is a conservative estimate; the percolation rate will likely be greater due to the high ground water elevation. At a percolation rate of 0.5 ft/day, a water balance in the PER shows that the wastewater recharge basin can accept all projected wastewater reuse effluent through the non-growing season. The capacity of the recharge basin will be verifiable prior to the final phase of development to ensure adequate capacity.

Disinfection

The draft permit includes disinfection limits as set out in the Rules. This permit limit is written as follows: "the median number of total coliform organisms shall not exceed 2.2 CFU/100mL and shall not exceed 23 CFU/100 mL in any confirmed sample, as determined from the bacteriological results of the last 7 days for which the analysis has been completed". The monitoring section of the permit requires that coliform be sampled daily at a point following disinfection. An accepted UV disinfection process will be installed to meet this and the 5-log virus disinfection requirement in the Rules. Class A wastewater does not have a residual chlorine requirement in instances where UV disinfection is utilized.

The UV disinfection system shall be operated in accordance with the manufacturer recommendations at all times. If at any time the treatment facility does not meet disinfection requirements, the effluent will be automatically routed back to one of the other treatment trains to be retreated prior to discharge.

Buffer Zones

The permittee has designed a barrier of natural wetland vegetation surrounding the recharge basin to dissuade the public from using the recharge basin for anything, since there will also be large bodies of water onsite for recreation. Signs warning the public of the source of the water in the recharge basin will be posted at a minimum of 250 foot intervals around the basin. The warning signs will read "Warning: Reclaimed Wastewater – Do No Drink" or equivalent in both Spanish and English.

Site Management

General management of the site is addressed in the draft permit as Compliance Activities in Section E. The permittee is required to submit to DEQ for review and approval a Plan of Operation, a Runoff Management Plan, a Waste Solids Management Plan, and an Operator Education Plan. Once approved, these plans will be included by reference into the permit and be enforceable as part of the permit.

The Plan of Operation is intended to be a comprehensive guide for the overall management and day-to-day operation of the site relevant to reuse water. The plan is expected to specifically address the requirements of the reuse permit in an operational guide manner. All sampling and monitoring procedures should be thoroughly addressed, and QA/QC procedures written out. The procedure for handling off specification effluent (routing to another train for retreating) and maintenance the UV lamps to ensure that viral inactivation is being met shall be specifically addressed. At a minimum, the design, operation, and maintenance procedures shall be addressed for minimizing the potential for odors, anticipating the need for maintenance of the recharge basin, and the procedure for periods of shutdown and low flow. Specific consideration for preventing runoff into the onsite water bodies and wetlands shall also be addressed. And finally, the procedure for anticipating, reacting to, and reporting a time when the recharge basin overflow weir has been used, and how this shall be prevented if possible will be specifically addressed. In addition, the Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater has a checklist in Appendix A.12 that should be used as a guide for developing the Plan of Operation. The plan shall be submitted at or before 50% completion of the reuse facility construction, and an updated plan is due 60 days after the first complete year of operation.

Prior to the application of reuse water the draft permit requires that a Runoff Management Plan and a Waste Solids Management Plan be submitted as compliance activities. These plans are required to ensure environmentally responsible management of the wastewater treatment plant. The Runoff Management Plan will address BMPs and other control structures designed to prevent runoff of reuse water to any property not owned by the permittee. The Waste Solids Management Plan will address how the permittee will handle and dispose of any solids generated by the treatment and reuse facilities.

An Operator Education Plan shall also be developed that outlines how the permittee will endeavor to educate home owners and any other operator of the reuse water system, as required by IDAPA 58.01.17.601.08.g. Operators are anyone, including home occupants, who utilize a combination of effluent and other irrigation waters. Operators shall be required to sign a utility user agreement provided by the utility providing the reuse water which states that the user understands the origin of the effluent and the concept of agronomic rate for applying the effluent. The plan shall include the utility use agreement, and a plan to undertake a public education program to teach potential customers the benefits and responsibilities of using Class A effluent.

Plans and specifications for irrigation piping are required by the draft permit as Compliance Activity No. 213-02. The plans shall show that the required separation distances between drinking water, waste water, and reuse water pipes are met. The plans shall also include any exterior drinking fountains, picnic tables, food establishments, and other public eating facilities to ensure that they are placed out of the spray irrigation area where reuse water is used. All exposed and above ground piping, risers, fittings, pumps, valves, etc. shall be painted purple, Pantone 512. In addition, all piping shall be identified using an accepted means of labeling reading “Warning: Reclaimed Water – Do Not Drink” in both Spanish and English lettering. In a fenced pump station area, signs shall be posted on the fence on all sides.

Recommendation

DEQ staff recommends issuance of the attached draft permit. The draft permit addresses disinfection requirements, constituent concentrations, and wastewater treatment plant performance. Monitoring and reporting requirements to evaluate the system performance and to determine permit compliance have been specified. Compliance activities, as recommended in the staff analysis, are incorporated in Section E of the permit.